

(57) Abstract: Processes and apparatuses (10) for commercial and home-use cleaning of textile. Home-use embodiments replace the home laundry clothes dryer except for embodiments using a novel manual kit (K). Soiled/stained textile (12, 14) sprayed dampened with solvent, preferably automatically in the dryer apparatus' rotatable drum (16); but the textile therein is not soaked nor immersed in solvent. Highly absorbent, untreated pad material (3, 56) is placed into the drum, for rubbing against the tumbling textile (12, 14), to remove the soil, stains and solvent, as well as provide wrinkle deterring hydration. Also, for home-use washer and washer-dryer combined units, the pad material (3, 56) can be placed into the drum (16) prior to the washing cycle, to enhance the scrubbing action.



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**Wrinkle Deterring and Textile Cleaning Processes and
Apparatuses**

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of U.S.
Provisional Application Serial No. 60/385,384, filed on
3 June 2002, entitled METHOD AND DEVICES FOR PREVENTING
5 WRINKLING OF TEXTILES IN DRYERS; and is a Continuation-
in-Part of prior pending U.S. Application Serial No.
10/333,675, filed on 22 January 2003, entitled TEXTILE
CLEANING PROCESSES AND APPARATUSES, which is a Title 15
U.S.C. Section 371 application of PCT Application No.
10 PCT/US01/23444, filed 25 July 2001, published in English
as WO 02/08510 A1, on 31 January 2002.

BACKGROUND OF THE INVENTION

Field of the Invention

15 This invention concerns textile cleaning processes
and apparatuses, useful in commercial facilities, group
housing and private dwellings.

Prior Art

20 Textile cleaning processes and apparatus have been
in use commercially for a considerable length of years.
For the most part, commercial processes have

changed/improved relatively little except for the use of less dangerous solvents. Likewise, commercial dry cleaning equipment, except for more automation, is mostly the same for the past fifty years and do that which was
5 done previously.

Commercial dry cleaning, as is well known, is not a dry process, it is basically a waterless process, using unhealthy, unfriendly and hazardous liquid solvents, in which the soiled textiles are immersed and mixed in a
10 rotating drum until the soil transfers from the textile into the solvent bath. Also, the volume of solvent needed to immerse the textiles in the drum presents its own problems: cost, storage space, proper disposal, filtering and recycling, etc.

15 Home-use laundry cleaning equipment typically comprises: a textile washing machine, in which the textiles are fully immersed in water with a detergent; and a separate drying machine, employing a tumbling drum, into which heated air is passed. Home-use laundry
20 equipment also comes in the form of a single piece of equipment, which first immerses, washes and drains, and then hot air dries the textiles; thereby providing housing space savings and eliminating the step of moving

the spun down, but very wet textile, from the washer unit into the dryer unit.

The two unit and one unit home-use laundry cleaning equipment, as well as commercial textile dryers, have a
5 common problem, the laundry and textile will become wrinkled, before removal from the dryer, unless there is closely timed human operator intervention to remove the textiles prior to wrinkling, but after sufficient drying. Home-use units, both the separate washer and dryer, as
10 well as the combined washer and dryer, also have the problems of inadequate cleaning and residual cleaning agent remaining after washing and drying.

Quite recently, there has entered the market place kits for home-use, in home clothes dryers, for freshening
15 and cleaning of garments which cannot be washed in water and are not so soiled that commercial dry cleaning should be used. Although such kits are convenient to use, their capability to satisfactorily remove soil is limited. Such kits have solvent impregnated, small, thin sheets
20 which are put into the dryer drum with the soiled garments. The heat within the rotating drum releases the solvent from those sheets into the atmosphere of the drum. The tumbling garments are "immersed" in the

solvent containing atmosphere for the cleaning function. The sheets also are impregnated with a pleasant fragrance substance, to impart a clean smell to the garment. Some kits also include pre-spotting solution, to be applied to
5 selected soil spots of the garment, prior to being placed into the dryer drum. A problem with the use of such kits is that either extensive pre-spotting is needed, or the cleaning is inadequate, or both. Some kits also include a bag into which the garments and impregnated sheets are
10 placed. The bag inhibits the garments from contact with the hot interior surface of the drum and also confines the solvent containing atmosphere.

DEFINITIONS

The term "textile" encompasses: fabrics, garments,
15 laundry, clothing and cloth.

The term "dryer" include: home-style clothes
dryers, coin operated garment dryers, commercial laundry
dryers, commercial fabric cleaning apparatus of the
fabric immersion type and also the non-immersed type (as
20 disclosed in our above cited applications); usually, such
dryers and cleaning apparatuses have drums which rotate
during the drying of the textiles therein.

The terms "washer", "washing machine", "home-use

laundry, or textile washing equipment" encompass top loading and front loading units, as well as washer and dryer combined units.

The terms "pad" and "padding" encompass highly absorbent components, such as components 3, 3', 54 and 56 shown in Figs. 1, 2 and 5.

The term "untreated" means that the pads do not initially contain cleaning solvent, contrary to prior art teachings.

10 When some textiles are being dried, in a drum-type dryer, after being laundered, cleaned in an immersion type or non-immersion commercial unit, these textiles can become wrinkled if they are dried too completely and/or too fast, before being removed from the dryer and placed
15 on hangers, or otherwise laid-out, to reduce wrinkle formation. Many home-type and commercial dryers have been equipped with means for combating the problem of wrinkling textile, for example: reducing the applied heat prior to the end of the drying cycle; controlling dryer
20 rotation speed and duration with respect to the type of textile, i.e. permanent press in contrast to cotton; humidity sensing; lower temperature for entire drying cycle; air/fluff drying without heat; etc. Also, the

dried load should not contain a mixture of different types of textile, which would hold different amounts of moisture, be of different thickness/weight.

Notwithstanding the design capabilities of the
5 dryers, experienced human operators have been necessary to ensure wrinkle free results.

Quite often, the human operator, rather than permitting too much drying, terminates the drying cycle prematurely and then examines the textile load in the
10 drum to determine moisture content. Thereupon, the operator can reset drying parameters, especially including a shortening or lengthening of the remaining drying time. Sometimes, stopping and restarting the drying cycle more than once is necessary to prevent too
15 much drying and resulting wrinkling. Also, textiles are considered desirably dried if they have a "nice hand", and "soft hand", are not shrunk, don't hold static electricity and don't retain from the final wash rinse soap, detergent, additives or soil.

20

SUMMARY OF THE INVENTION

Undesired textile wrinkling and other above mentioned problems can be resolved by use of the present invention, in which absorbent padding is placed in the

dryer drum for retaining moisture longer than the textiles being dried; and the moist padding keeps the atmosphere in the drum highly humid. Thus, the textiles are not dried to the point of wrinkling, because they do not lose their moisture content too fast. Also, when the textiles tumble into contact with the padding, the padding absorbs moisture from the textiles, imparts a soft hand and nice hand. Additionally, the contact between textiles and padding is a rubbing motion, which transfers any residual soaps, detergents, additives and soil from textile to padding. The padding can be secured to the interior of the drum, as shown in Figs. 1, 2, 4 and 5, with reference to pads 3', 54, 115 and 117 and/or be loose, as the pads 3 and 56 in some of those same Figs. The loose pads can be wetted prior to being placed in the drum. The secured padding can be wetted prior to the textiles being placed into the drum or subsequently; also as taught in our above cited applications.

In the commercial and automated home-use dryer embodiments, the textiles are not immersed in solvent. A sufficient, small amount of solvent is sprayed, onto the textiles when inside the drum, early in the cleaning process. Thereupon, rotation of the drum brings the

textiles and pads into frictional contact, repeatedly. The pads can be removably fastened to the "lifting" ribs and body of the drum and/or be free to move about in the rotating drum. For this home-use embodiment, if there
5 are no ribs to secure the highly absorbent, untreated pads, the pads are placed loosely in the drum.

In a manual home-use embodiment, the textiles are sprayed, not soaked nor immersed, with the cleaning solvent, prior to being placed into the drum.

10 For the home-use, stand alone washer and washer-dryer combination, the pads also can be removably secured to the interior of the drum at convenient locations.

Other features of the improved process and apparatus will be disclosed in the next following detailed
15 description.

BRIEF DESCRIPTION OF THE FIGURES

FIG. 1 is side view of the commercial cleaning machine of the invention, with its side cover removed and somewhat pictorial, showing major component parts; FIG. 2
20 is a front view of the cleaning machine of Figure 1, with its front cover off, somewhat pictorial, showing major component parts, with pads and textile in the drum;

FIG. 3 is a partial side view of a home-use unit,
with its side cover removed;

FIG. 4 is a partial view of a home-use laundry
washing unit, somewhat pictorial and broken away to show
5 the mounted pads; and

FIG. 5 is a pictorial illustration of the contents
of a home-use starter kit, with components not to scale
with respect to each other.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

10 Described first will be the home-use, suitable for a
kit sold in grocery stores, embodiment. As shown in FIG.
5, the contents/components of a starter kit K would be: a
bottle 1 of solvent 1', preferably with a spray
dispensing head 2; a plurality of highly absorbent,
15 untreated pads 3, and instructions 4 for their use in a
standard, home style, clothes dryer. Optionally, the kit
K also could include a one-use or repeat-use containment
bag 5 for holding the textiles and pads in the drum of
the dryer, one purpose of which is to keep the textiles
20 hydrated with the solvent for a sufficient time. Another
optional component, especially useful if a containment
bag is not used, is covering means 6, positionable over
the typical lint filter of the home style dryer, to

reduce air flow from the dryer drum, thereby to keep the textiles hydrated with the solvent for a sufficient length of time; so that their frictional contact with the pads is such that the pads are rubbing over the damp
5 textile, to rub off the soil and absorb the solvent.

Also optional, but preferred, is a container 7 of spot removing liquid 7' having an applicator tip and a spotter bone 8 and brush 9; to be used before and/or after cleaning by the process of this invention, as might be
10 needed for stubborn/unique spots of soil.

The pads 3 for this home-use unit embodiment can be of a wide range of shapes, sizes and materials; and, for that reason, are not shown in detail in any Figure of this specification. These pads should have enough mass
15 to frictionally confront and rub against the textile. A thickness of about one-quarter to one-half inch (about 0.60 to 1.25 cm.) has worked well with surface areas of ten to fifty square inches (about 65 to 325 cm. sq.). The quantity of pads depend upon their sizes, the amount
20 of textile material to be cleaned, the volume of the drum, the duration of drum rotation, the rate of solvent evaporation and extent to which the textile is soiled. Additional variables are the material of the textile and

its thickness. Also, some solvents can function better at different temperatures than others, which can affect their evaporation rate. The quantity and weight of the textiles being cleaned and the amount of the pads should
5 be such that the random tumbling movement of the pads and the textiles in the rotating drum causes a considerable amount of surface-to-surface rubbing contact therebetween, which is essential for adequate cleaning by this process. The material of the pads is to be highly
10 absorbent, smooth texture and not the source of any undesirable amount of lint from its own body or because of its rubbing against the textile. Cotton, felt, terry, etc. are materials of the type which provide the absorbance, smoothness and weight desirable for a pad to
15 be used in both this home-use and the commercial embodiments of this invention. Preferably, the pads can be used for a few loads of cleaning, before they are too dirty to be used again. Then, they can be cleaned/washed for further use. When used with the washing unit 101 of
20 FIG. 4, which also could be a combined washer and dryer, the pads would become soaked during the washing cycle and be useful as a scrubbing surface, against which the tumbling textiles would rub. However, if the apparatus

is a combined washer and dryer, the soaked pads could carry too much hydration into the drying cycle, even though such combination units have a high speed wash liquid extraction spin cycle (1,200 RPM). Accordingly, pads for these "combo" units could be thinner than for stand alone dryers.

The solvent 1' and the optional pre-spotting liquid 7' can be selected from any of many existing, as well as future formulated, user friendly and environmentally approved liquids, including water-based cleaners and water diluted mixtures thereof. A few examples of such solvents are:

DF-2000, a synthetic aliphatic hydrocarbon manufactured by Exxon Chemical Co., Houston, TX.; Vista LPA-142, a paraffinic, maphthenic, manufactured by Vista Chemical Co., Houston, TX.; N-Ta Germ Liquid, an alkyl dimethyl benzyl amonium chloride; N Ta Germ Wet Clean additive: DWX-44 detergent, DWX-Spray Spotter, Kleerospray Spotter, Nature-L additive, each manufactured by Kleerwite Chemical, Burke, VA; Cal-Off, a pre-spotter, diethylene glycol methyl ether, manufactured by Caled Chemical, Wayne, NJ; and Zuds, a water based spotting compound, also manufactured by Caled Chemical.

Experience to date indicates that the solvent can contain at least 75% water and the spotter should be more concentrated. As is known, a spotting solution can be used before and/or after the textile is cleaned in the
5 drum.

The optional containment bag would have sufficient volume to hold a few garments/textiles and the above identified pads 3, such that the textiles and pads can tumble freely within the closed bag as the drum rotates.
10 The bag would have some form of closure 5' and be of a material which can withstand repeated use. It can have one or more layers, one of which would be somewhat vapor impermeable, to reduce the rate of evaporation of the cleaning solvent; whereby, the solvent can be of maximum
15 use in working on/in the textile, for removal of the soil and the used solvent onto the pads. In a preferred embodiment of the containment bag 5, it would have an inner layer or liner 3' of the pad material, to enhance the rubbing off of the soil from the textiles. Having
20 some or all of an inner layer 3' of the highly absorbent, untreated pad material can reduce the amount of the pad pieces 3 otherwise placed into the containment bag, or the drum, if there is no bag. Under some conditions of

textile material and soil content, it would be sufficient for the pad inner layer to obviate need for the individual pieces of pad.

As noted above, it is important to keep the textiles hydrated with the solvent 1' for a sufficient duration, without immersing or soaking or even wetting down the textiles prior to placing them directly into the drum, or into the containment bag which then goes into the drum. Preferably, the textiles are only mist-sprayed with the solvent. Accordingly, especially when a containment bag is not employed, the home-style dryer should be inhibited from the extent/rapidity of its normal venting, by reducing the amount of air flow into and out from the drum. Typically, the primary amount of venting air passes through the lint filter. Hence, blocking of the lint filter will reduce the solvent evaporation rate. Such blocking can be partial or total and can be accomplished in various ways by various means; one simple means would be the insertion of a piece of fabric 6 into and covering the lint filter.

The duration of textile tumbling in the dryer drum with the highly absorbent, untreated pads, will depend upon the size of the drum, the size of the load, the

amount of pads and the textile material. About 20-30 minutes usually will be needed. It is to be appreciated that the cleaning process according to this invention does not require that the textile be dry before removal from the dryer. To the contrary, if the textile is too dry, it could wrinkle. Preferably, the textile is removed from the dryer drum and containment bag if such bag is used while the textile is slightly damp. Then, the textile is placed on a hanger or the like to dry without wrinkling.

In one embodiment of the invention, only loose pads are employed, such as the pads 3 and 56 shown in incorporated Figs. 2 and 5. In a second embodiment, only attached pads or padding are employed, such as the components 54, 115 and 117 shown in Figs. 1, 2 and 4 which are removably attached to the interior of the drums. A third and fourth embodiment employs one or both attached and loose pad components, such as 56, 3 and 54, in the rotating drum. A fifth embodiment can be the textile containment bag 5 having an inner lining or layer of pad 3' and/or pieces of the pad 3 therein, as shown in FIG. 5. In all of these embodiments, the primary purpose of the highly absorbent pads/padding is to contain

sufficient liquid to keep the humidity level into the drum very high, during the full dryer cycle, while the pads themselves are drying at a much slower rate than the thinner textiles. In the wash and spin cycles of the unit 101 of FIG. 4, the pads 115 and 117 provide sol
5 removing scrubbing action.

The loose pads 3 and 56 can be placed into the dryer pre-wetted or dry. If dry, then the pads would need to absorb moisture from the wet textile. The
10 attached pad material 54 would be made wet by the wet textile; and/or could be sprayed with water from the nozzles 26 and 74, as shown in FIGS. 1, 2 and 3.

Not only do the textiles obtain some moisture from the wet pads when rubbing/brushing against each other
15 during tumbling in the drum, the textiles do not become over dry and lose their natural moisture content, because the wet pads maintain a high level of humidity in the drum. This prevents wrinkling of the textiles, imparts a soft hand, prevents shrinking and eliminates static
20 electricity. By brushing against the textiles, the pads also help impart a nice hand. The pads, especially the attached pads 54, buffer the drop of the textiles against the metal interior of the drum, thus helping to prevent

broken buttons, zippers and textile trim. Also, because the pads absorb wash water from the textiles, the pads absorb soap, detergents, additives and soil left in the textiles after the final wash rinse.

5 The process of the commercial/professional embodiment of this invention is very similar to the home-use embodiment, except it takes advantage of being able to use some existing commercial dry cleaning technology and improve upon it. Primarily, the novel features of
10 the commercial embodiment are: (1) The solvent mist spraying and air/water/steam jetting upon the textile are automatically accomplished in the drum, while the drum is rotating and during rotation dwell times. (It is to be emphasized that the textile is not immersed in a solvent
15 or water bath, nor soaked in the solvent or water.) (2) The untreated, highly absorbent pads are secured to the lifting ribs of the drum. (3) Regulation of air flow, drum temperature, drum r.p.m., solvent spraying, and moisture level are accomplished by sensors and computer
20 controls.

Many of the mechanical elements shown in FIGS. 1 - 3 are not discussed hereinafter, since their presence and operation are not essential to a full understanding of

the invention claimed herein. Those same FIGS. 1 - 3 are found and their elements described in our above cited United States and PCT applications.

More specifically and with reference to FIGS. 1 and 2, the commercial textile cleaning machine 10 can be an existing piece of equipment, modified to employ the novel process of this invention. However, a new, simpler, textile cleaning machine 10 can be built to perform the new method.

10 With reference to FIGS. 1 and 2, which show somewhat pictorially the side and front views of a commercial dry cleaning machine 10, with cover panels removed, embodying the invention, but showing only major components; it will become evident to those skilled in the art that the machine 10 is simpler than an existing commercial dry
15 cleaning machine, can be less rugged, more economic and simpler to use. Since the process employing the machine 10 does not immerse the textile 12, 14 in a solvent bath, nor even soak that textile in solvent, there is no need
20 for placing many gallons of solvent into the drum 16; thus avoiding having hundreds of pounds of solvent supported in the revolving drum. There is not any expensive and bulky solvent recovery and recirculation

system, since less than one quart (one liter) of solvent is needed by the invention per twenty-five pound (11 kilograms) load and mostly is absorbed by the untreated pads and/or are vented out with the soil particulates.

5 Hence, the solvent container 18 can be housed easily within the machine 10 and connected to a pump 20, which will pump the solvent into the drum 16 as a spray mist, via lines 22, 24 and jet heads 26. The solvent tank 18 can represent a plurality of tanks coupled in parallel
10 and holding different: solvents, conditioners, sizing, water proofing, fire proofing, etc. substances. The pump 20 can generate 60 to 110 p.s.i. Alternately (not shown), a barrel or large tank of the solvent can be located outside of the machine 10 and connected to the
15 pump 20. Since the pump is moving a small quantity of solvent, it can be smaller than presently needed in commercial dry cleaning equipment. If there results a small volume dirty waste liquid, it can be collected from the drum by waste disposal means 28, 30 and then removed
20 according to regulatory/environmental procedures, which could be as simple as flushing down to a sewer; which is especially a viable form of waste disposal, since a preferred embodiment of the solvent can be water-based.

Since the drum 16 is not to contain a heavy volume of solvent, it can be a lighter structure, have lighter support and be rotated by a smaller motor 32, coupled to the rear 33 of the drum via a belt 34, driven shaft 35, etc. than present dry cleaning machines. The motor 32 also can be used to drive the air circulation fan 36, but separate motors (not shown) could be more practical. The interior periphery of the drum 16 is perforated 38, as is typical, so that not only the air circulated by the fan 36 can enter the drum, but especially the jet mist spray of solvent 18, can enter via the jet heads 26, which are positioned next to the drum. The jet heads 26 also can supply air only, or pressurized water from an interior supply 39 or an exterior supply, or a mixture of air and water. The jet heads 26 are position to direct solvent, etc. along the axial direction of the drum and at right angles thereto, so as to dampen the textiles from plural directions. Since the rear end 33 of the drum 16 is closed, except for the perforations 38, the jet heads 26, pointing into the drum's rear end, would be journaled (not shown) for rotation with the drum. For ease of viewing the FIGS., the perforations 38 are not shown in FIG. 2 and only a few are shown in FIG. 1.

For the same reason as discussed for the home-use embodiment, the commercial embodiment requires the textile 12, 14, to remain damp with solvent; hence, solvent evaporation rate needs to be retarded/controlled.

5 Such control is provided by a damper 40, which is located in an air output line 42 and an air recirculation line 44 that returns air from the drum to the input side of the fan 36, for reintroduction into the drum, via the perforations 38. If the damper 40 is closed, the

10 recirculating air, which also carries solvent moisture, is passed through a lint and dirt filter 41 and returned to the drum to help in continuing the hydration of the textiles. If the damper is open, the moist air can pass outward through the output line 42. If needed, to

15 increase the hydration, moist air and/or steam can be supplied through the jet heads 26 from a line 45, which is connected to a source (not shown), such as a small external boiler. Such steam/moisture also can be supplied at selected times to: clean water soluble

20 stains; reactivate solvent on the drying textiles; and give a final "hand" to the textiles. Also, the fan 36 can be turned off as well as have its speed changed, via a program panel 46. The program panel 46 is connected to

preset the sequential operations of the machine 10 into various modes, as well as enable random inputs by an operator. Opening and closing of the damper 40 is one of the many operations via the program panel 46.

- 5 The machine 10 also includes an air compressor 48, which can be part of or separate from the pump 20, but can be used in conjunction therewith. The compressor can be used to provide the jet action for the jet mist solvent spray through the line 22, 24 and jet heads 26.
- 10 Also, the compressor 48 can supply jets of air, without accompanying solvent, through the jet heads 26, for purposes discussed further below, and for propelling steam/moisture from line 45.

- A heater 50 is provided to warm the circulating air.
- 15 The program panel 46 controls when the heater is on and what temperature is to be provided. Programming also controls various valves, only a few of which are illustrated in FIG. 1. The term "program panel" is used herein to represent all needed programming means,
- 20 sensors, etc., etc., since such programming means and operations are well within the skill in the art.

Typically, drums of dry cleaning machines contain a plurality of textile lifting ribs 52 which cause the

textiles to be lifted away from the periphery of the rotating drum and tossed toward its axis of rotation. Such ribs 52 play an important additional roll in the present invention. The highly absorbent, untreated pads 5 52 are removably mounted along these ribs. For ease of viewing FIGS. 1 and 2, only a few of the ribs 52 are shown, and only three of the ribs, one in FIG. 1 and a different two in FIG. 2 have pads 54 mounted thereon. In actual practice, both sides of each rib 52 can support 10 pads 54. If there are four ribs 52 in a drum and they project radially inward five inches and are thirty six inches long (about 13 cm. high and 90 cm. long), they can support approximately one thousand, four hundred and forty square inches of pad, which is ten square foot of 15 surface (approximately 9,360 cm. sq.). The rotation of the drum 16, for twenty to thirty minutes, with this pad surface, will result in a significant amount of soil removing, rubbing contact between the textiles 12, 14 and the pads 54. If conditions require more pad surface, the 20 drums can be built with more ribs; also, loose pads 56, as employed in the home-use embodiment, can be put into the drum 16. Typically, the ribs 52 are perforated, or can be perforated as at 58. The pads 54 can be provided

with clips (not shown) for detachably mounting the pads onto the ribs. Other mounting means, such as Velcro or adhesives can be used, so that the pads can be removed for periodic washing and/or replacement.

5 A significant improvement in a home-use textile cleaning process and unit 64 next will be described with reference to FIG. 3. This unit and process employ both the mist spraying of solvent air and water into the drum and the highly absorbent pads of the commercial
10 embodiment of FIGS. 1 and 2; hence, it does not use the textile containment bag 5, nor the manual pre-spraying of the solvent onto the textiles, as described hereinabove with reference to FIG. 5 and the home-use kit K. This home-use unit 64 basically starts from a typical home-use
15 clothes/laundry dryer, with its horizontal axis rotatable drum, heater, filter, etc.; hence, these components are not shown in FIGS 3. Also not shown is the typical front loading access door and electric controls. It is to be understood that this new unit 64 also continues to be
20 usable as a typical home-use laundry room clothes dryer.

FIG. 3 shows the right side 66, near its rear, with its side panel 68 removed, of the home-use unit 64. A refillable supply of Dry-Wetcleaning™ solvent is

supported in a container 70 in the interior of the unit 64 and has its capped refill opening 72 projecting out from the top of the unit. A plurality of spray heads 74 are coupled to both the solvent container 70 and a
5 compressor 76, so as to be able to spray solvent through perforations (not shown) in the typically non-rotating end cover 78 of the rotatable drum (not shown); whereby, textiles in the drum can be dampened by the solvent, similar to the jet spray solvent dampening in the
10 commercial embodiment of FIGS. 1 and 2.

If the interior of the drum has lifting ribs, such as the ribs 52 shown in FIG. 2, or the interior of the drum is adapted to have pads 54 secured thereto, then the solvent spray dampening, the textile cleaning and
15 hydration by rubbing against the absorbing pads 54 will be accomplished in much the same manner as in the commercial embodiment disclosed with reference to FIGS. 1 and 2; exceptions being that in that embodiment there is more automation and the drum 16 can rotate in opposite
20 directions, between which there can be programmed dwell time used for additional spraying of the solvent, etc. If the pads 54 are not secured to the interior of the drum, or such pads do not provide sufficient rubbing,

absorbent and hydration absorbent surface, loose pads 56 would be placed in the drum.

Thus, a conventional domestic clothes dryer can be replaced by the home-use unit 64, having all the functions of the domestic clothes dryer, most of the Dry-
5 Wetcleaning capabilities of a commercial machine 10 according to the embodiment of FIGS. 1 and 2.

FIG. 4 is to be understood as showing a home-use laundry washing machine 101, or a washer-dryer
10 combination unit 101. Although the drum or basket 103 is shown vertically for top loading, it could, for purposes of the inventive feature next described, be front loading, with the drum positioned horizontally. For ease of understanding FIG. 4, a typical, vertically standing
15 agitator is not shown in the drum. In fact, some laundry washing units do not have such typical agitators, but have other mechanisms for agitating or mixing the detergent or solvent in the drum with the laundry (textile), to achieve cleaning action.

20 The drum or basket 103 typically is manufactured with numerous peripheral perforations 105, only a few of which are shown in FIG 4. The well known function of the perforations 105 is to permit spin cycle extraction of

the liquid detergent/solvent from the drum. The drum or basket 103 also can be provided with ribs 107, only one of which is shown, that are similar to the ribs 52 shown in the drum 16 of FIGS. 1 and 2, lying parallel to the axis of the drum and secured to its periphery 109. In addition to the known textile lifting function of the ribs, when there is generated relative motion between the drum periphery 109, the solvent/detergent (not shown in FIG. 4) and the textiles, for example 111 and 113, the ribs 107 can be used to removably support pad material 115 which would come into frequent rubbing contact with the textiles 111 and 113 and act as scrubbing brushes. Similarly, some of the perforations 105 can be used to removably support other pieces of scrubbing pad material 117 (only one of which is shown in FIG. 4). The pad material can be the same substance as the highly absorbent pads 54 and 56, above described and shown in FIGS. 1 and 2. If the unit 101 is a combined washer and dryer, then the pad material 115 and 117 will serve a dual purpose: (a) to enhance textile cleaning, by acting as textile scrubbers in the wash mode; and (b) to deter textile wrinkling in the drying mode, by maintaining textile hydration.

The hereinabove description of the commercial/professional and home-use processes and the embodiments of textile cleaning machine 10 and home-use units 64 and 101 should enable those skilled in the art
5 to construct new textile cleaning machines, or make modifications to an existing dry cleaning machine, home-use clothes dryer, home-use washer-dryer combo and home-use laundry washer, employing highly absorbent pads, while remaining within the scope of the inventions. The
10 same applies to the first described home-use process and the components kit K for use therewith.

That which we claim is:

1. In a process for cleaning textile in a drum
within a machine, said process characterized by the steps
of:

dampening the textile with liquid, other than
5 for spotting, in the absence of soaking or immersing the
textile in liquid;

controlling the duration that the textile
maintains hydration; and

said controlling including at least in part
10 placing highly absorbent pad material into the drum for
absorbing at least some of the liquid in the textile and
drum for release back into air within the drum and into
the textile at a rate slower than being released from the
dampened textile.

2. In the process according to claim 1,
characterized by the step of dampening being:

manually dampening the textile with solvent,
exterior to the drum and machine.

3. In a process according to claim 1 said step of dampening being characterized by:

spraying automatically the solvent into the drum from exterior the drum.

4. In a process according to claim 3, said step of dampening also characterized by:

spraying automatically into the drum, from exterior the drum, at least one of steam, air and water.

5. In a process for cleaning textile in a drum within a machine, said process characterized by the steps of:

placing highly absorbent pad material into the
5 drum;

generating relative movement between the textile, the pad material and cleaning/rinsing liquid in the drum; and

scrubbing action thereby being caused by the
10 pad material upon the textile.

6. In the process according to claim 5, the machine being a combination textile washing and drying machine, characterized by the steps of:

absorbing, by the pad material, some of
5 cleaning/rinsing liquid from the textile and the drum,
during said scrubbing action;

retaining the pad material in the drum after
the scrubbing action and throughout textile drying by the
machine; and

10 controlling the duration of hydration that the
liquid has imparted to the textile by releasing some of
that liquid from the pad material back into the textile
and the drum.

7. In the process according to claim 5 or 6,
characterized by the step of:

securing at least some of said pad material to
the interior of the drum.

8. In the process according to any one of claims 1, 3 or 6, the step of:

removing the textile from the drum when the textile has sufficiently dried, but also retains enough hydration to be substantially wrinkle free.

9. Apparatus for cleaning textile (12, 14, 111, 113) in a drum (16, 103) within a machine (10, 64, 101), said apparatus characterized by:

dampening means (20-26; 48) for applying solvent (18, 70) to the textile, other than for spotting, to dampen the textile, in the absence of soaking or immersing the textile in the solvent or any liquid; and highly absorbent pad material (3, 54, 56, 115, 117) in said drum;

said pad material and the dampened textile, being in rubbing contact in said drum; whereby, soil and solvent are transferred from the textile (12, 14, 111, 113) to said pad material (3, 54, 56, 115, 117) and;

at least near the end of the cleaning, while the textile is drying in said drum, said pad material hydrates the textile to deter the formation of wrinkles.

10. Apparatus according to claim 9, characterized in that:

at least some of said pad material (54, 115, 117) is detachably secured within said drum (16, 103).

11. Apparatus according to claim 9, wherein said drum (16, 103) has interior lifting ribs (52, 107); characterized that:

said pad material (54, 115) is detachably
5 secured to said lifting ribs (52, 107).

12. Apparatus according to any one of claims 9-11, characterized wherein,

said pad material (3, 54, 56, 115, 117) is untreated.

13. Apparatus according to any one of claims 9-11, characterized wherein,

said pad material (3, 54, 56, 115, 117) is felt and is untreated.

14. Apparatus according to claims 9 or 10,
characterized in which,

said dampening means is constructed and
arranged (18-26; 74, 76) to spray solvent (18, 70)
5 automatically, from exterior said drum, into said drum
(16, 103).

15. Apparatus according to claim 14, characterized
by:

automatic spraying equipment (18-26; 74, 76),
for additionally spraying into said drum (16) at least
5 one of air (48), steam, or water (39), without soaking or
immersing the textile in liquid in said drum.

16. Apparatus for cleaning textile (12, 14, 113,
115), characterized by:

a drum (16, 103) within a machine (10, 101);
highly absorbent pad material (3, 54, 56, 115,
5 117) in said drum);

means for introducing liquid into said drum for
cleaning and rinsing textile (12, 14, 111, 113) in said
drum; and

means for generating relative movement between
10 the textile, the liquid and said pad material;

whereby said textile rubs against said pad
material, causing a scrubbing of said textile.

17. Apparatus according to claim 16, characterized
in which:

said machine is a laundry washing machine
(101); and

5 said pad material (115, 117) is attached to
the interior of said drum (103).

18. Apparatus according to claim 16, characterized
in which:

said machine is a combination washing and
drying machine (101);

5 said pad material (115, 117) is present in said
drum (103) during washing and drying of the textile (111,
113); and

said pad material (115, 117) defines a source
for hydration of the textile during drying thereof in
10 said drum; whereby,

the textile does not dry to the extent that
15 wrinkles are formed prior to the textile removal from
said drum.

AMENDED CLAIMS

[received by the International Bureau on 20 October 2003 (20.10.03);
original claims 1-18 unchanged, new claims 19-21 added (2 pages)]

Concerning Seeburger, US 4,920,662, the Search Report lists claim 6. Possibly there is a clerical error and claim 7 was intended? Clarification is requested.

With respect to the five patent documents of category X and their alleged relevancy to claims 5, 7, 16 and 17, Applicant urges that none of these patents are relevant under category X, or even Y, for at least the following reasons:

Hoeflin, US 3,633,538 teaches the "conditioning" of fabrics with a solid-type fabric conditioner. Applicant's claims are directed to "cleaning". As well known in the pertinent industry, "conditioning" is not "cleaning". Moreover, '538 does not teach or suggest the independent claim 5 and 16 recited "highly absorbent pad material"; nor "scrubbing by" such pad material in the drum. Hence, the claimed invention should be considered both novel and involving an inventive step.

Grand et al. US 3,698,095 teaches a solid "conditioner", which is released from a substrate, when in contact with tumbling fabric. Grand et al. lacks any disclosure, suggestion or teachings above quoted with

respect to Hoeflin '538 and thus does not inhibit a finding of novelty and inventive step of independent claims 5 and 16.

Hendrickson, US 4,254,139 discloses a dispenser of "conditioner", but does not teach or suggest the limitations in independent claims 5 and 16 with respect to "scrubbing" the textile by rubbing thereagainst. Thus, these claims contain novelty and inventive step over '139.

Seeburger US 4,920,662 teaches a lint remover for use in a tumble-dryer. There is no teaching or suggestions of a "highly absorbent pad material"; nor "cleaning/rinsing liquid" as in claims 5 and 16; hence, these claims should be found both novel and having inventive step over '662.

Thurman US 5,147,715 teaches a heat retentive and desiccating pad for use in a clothes dryer, to decrease the drying time. Independent claims 5 and 16 have no such function for its recited pad material, which is for "cleaning", "scrubbing", etc. In fact, although not part of the recitation in claims 5 and 16, the pads in a clothes dryer would not decrease drying time, but by hydration of the textiles, would tend to increase total drying time.

Thus, '715 does not negate novelty nor inventive steps of claims 5 and 16.

Wherefore it is respectfully requested that new claims 19-21 be entered, and that Applicant's comments as to the relevance of cited patents be considered.

the textile does not dry to the extent that wrinkles are formed prior to the textile removal from said drum.

19. For use in a process for drying wet textile in a rotatable drum of a textile dryer, the invention comprising:

highly absorbent pad material, for maintaining hydration of the initially wet textile in the drum by;

absorbing some of the liquid in the wet textile, when the pad material and the textile rub against each other during rotation of the drum; and

releasing back, from the pad material to the textile and the interior of the drum, some of the liquid at a rate slower than being removed from the textile.

20. The invention according to claim 19 in which said pad material is secured to the interior periphery of the drum to provide at least one of:

a cushion protective of buttons and zippers on the textile as they tumble in the rotating drum; and a smooth, soft hand finish to the drying textile.

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AMENDED SHEET (ARTICLE 19)

21. In a kit for use with a textile dryer having a rotatable drum:

highly absorbent pad material to be placed in the drum with liquid wet textile;

whereupon, at least near the end of the typical drying cycle, said pad material hydrates the textile to deter formation of wrinkles.

STATEMENT

Applicant notes with appreciation that numerous of the eighteen claims searched have no relevant documents cited in categories X or Y, namely 1-4, 9-15 and 18.

Fig. 1

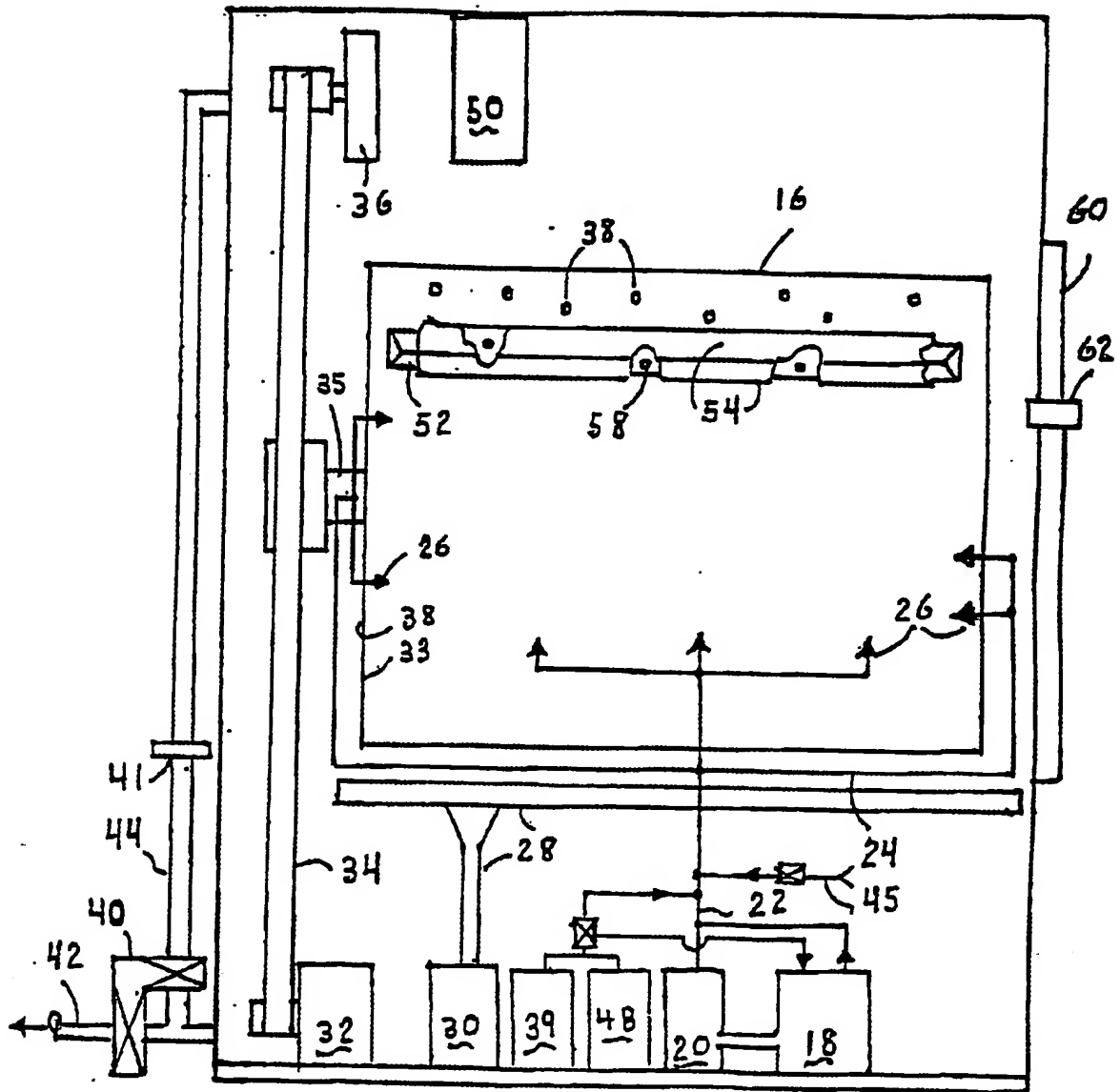
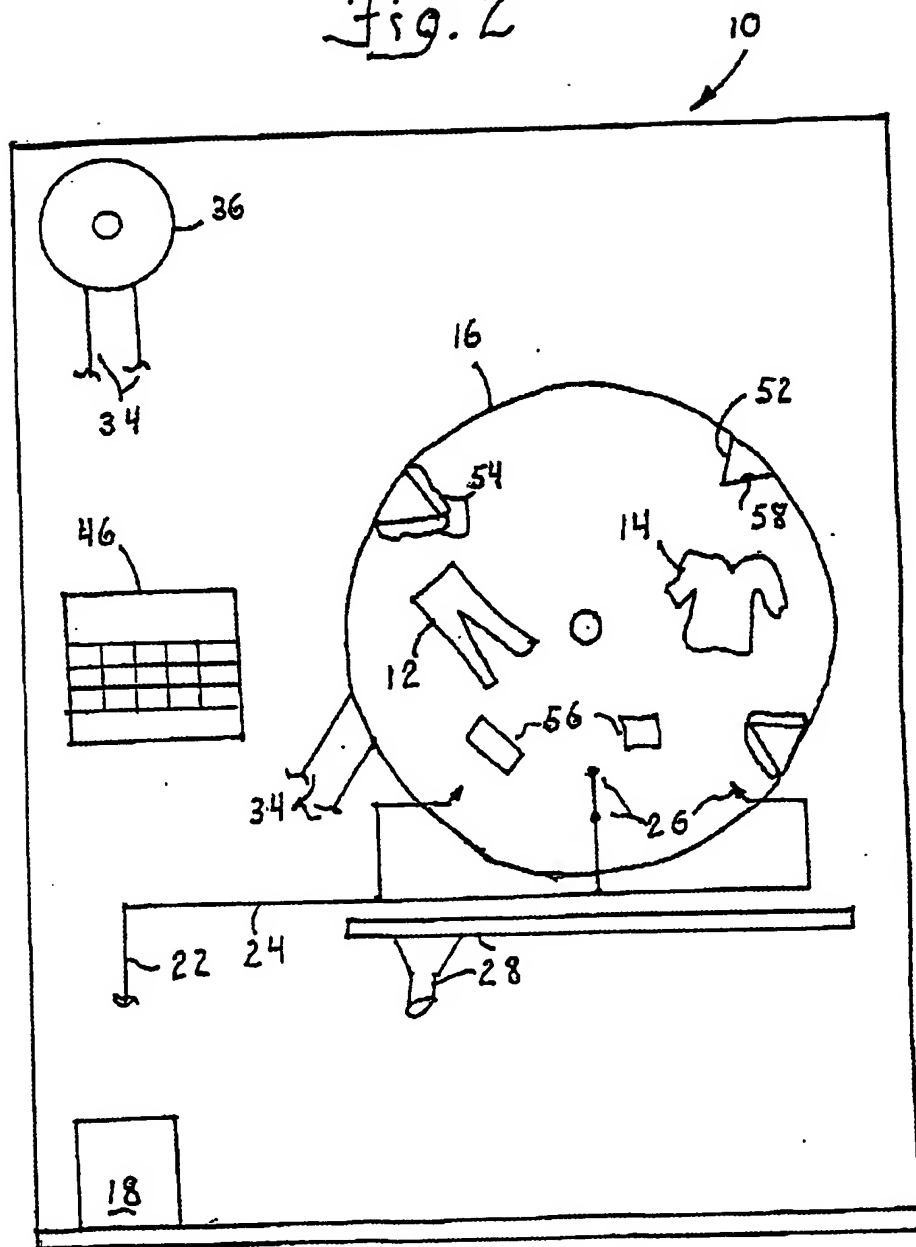
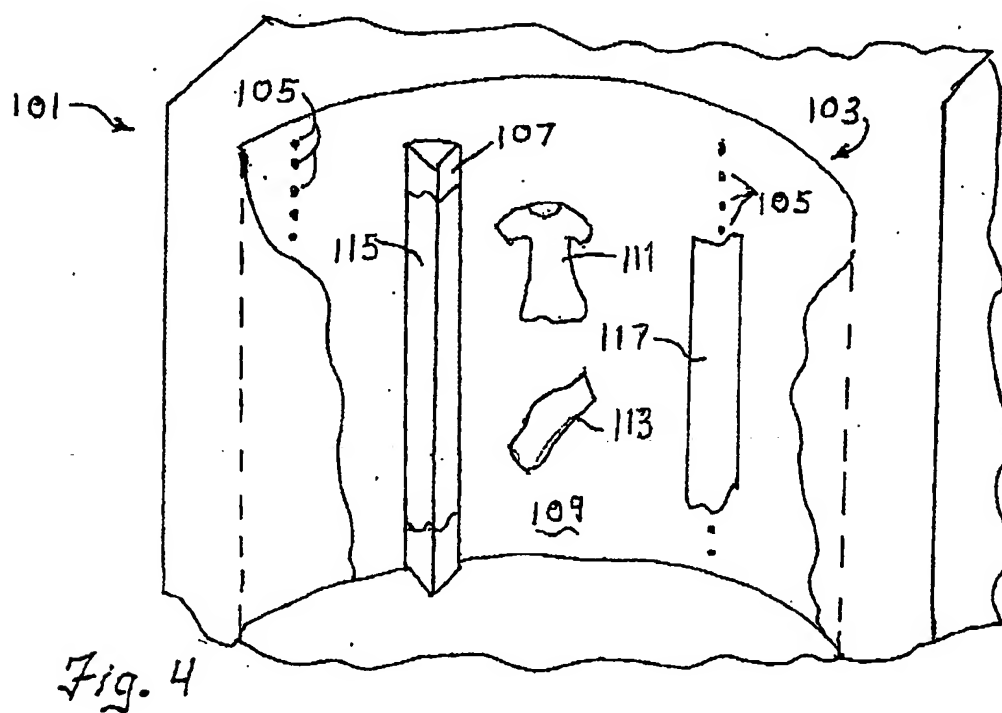
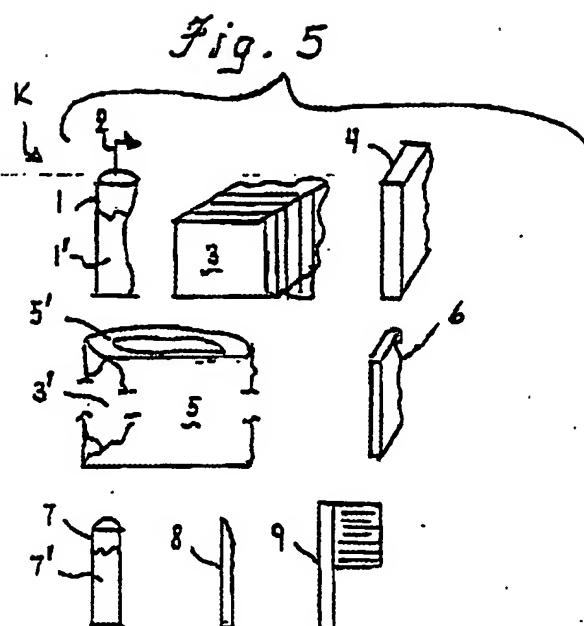
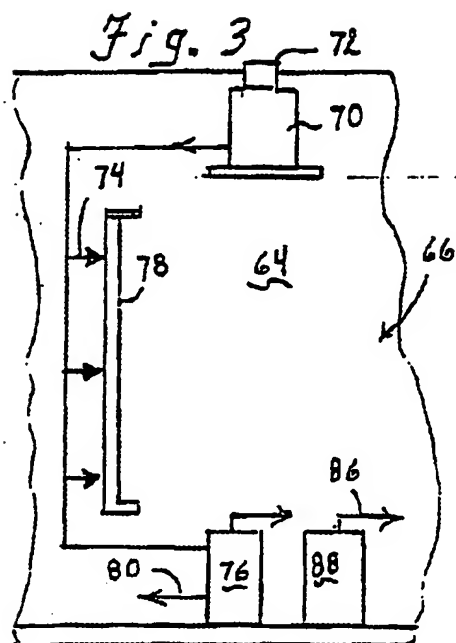


Fig. 2





INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/17392

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : D06F 39/02

US CL : 8/158

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 8/158, 159; 68/5R, 12.14, 29, 30, 139

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 82,722 A (KELLY) 06 OCTOBER 1868 (06.10.1868).	1-18
A	US 3,261,185 A (RIHR) 19 JULY 1966 (19.07.1966).	1-18
X	US 3,633,538 A (HOEFLIN) 11 JANUARY 1972 (11.01.1972), see cols. 1-2.	5, 7, 16, 17
X	US 3,698,095 A (GRAND et al.) 17 OCTOBER 1972 (17.10.1972), see cols. 1-16.	5, 7, 16, 17
A	US 4,004,685 A (MIZUNO et al.) 25 JANUARY 1977 (25.01.1977).	1-18
A	US 4,236,320 A (SCHWADIKE et al.) 02 DECEMBER 1980 (02.12.1980).	1-18
X	US 4,254,139 A (HENDERICKSON et al.) 03 MARCH 1981 (03.03.1981), see cols. 1-10.	5, 7, 16, 17
X	US 4,920,662 A (SEEBURGER) 01 MAY 1990 (01.05.1990), see cols. 1-6.	5, 6, 16, 17
A	US 5,040,311 A (ROY) 20 AUGUST 1991 (20.08.1991).	1-18

☒ Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

27 July 2003 (27.07.2003)

Name and mailing address of the ISA/US

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INTERNATIONAL SEARCH REPORT

PCT/US03/17392

C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,147,715 A (THURMAN) 15 SEPTEMBER 1992 (15.09.1992), see cols. 1-6.	5, 7, 16, 17
A	US 5,980,583 A (STAUB et al.) 09 NOVEMBER 1999 (09.11.1999).	1-18
A	US 6,243,969 B1 (YEAZELL) 12 JUNE 2001 (12 JUNE 2001).	1-18

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